UNIVERSITY OF ALBERTA LIBRARY
0 0003 4691 170

Grade 3 Mathematics Achievement Testing Program

Provincial Report

December, 1982

Distribution:

Officials of Alberta Education
School Principals
Superintendents of Schools
The Alberta Teachers' Association
Alberta School Trustees' Association
General Public upon Request

Alberta
EDUCATION

LB
3054
C2
D3333
1982

EDUC

Ex libris
universitatis
albertaensis

TABLE OF CONTENTS

	Page
LIST OF TABLES	iii
LIST OF FIGURES	v
ACKNOWLEDGMENTS	vii
INTRODUCTION	ix
EXECUTIVE SUMMARY	xi
Chapter I: THE ACHIEVEMENT TESTING PROGRAM	1
Purpose	1
1982 Tests	1
Exemptions from Testing	2
Chapter II: DESCRIPTION OF TEST AND SAMPLE	3
Test Development	3
Test Description	4
Sample	6
Chapter III: RESULTS	7
Guidelines for Interpretation of Results	7
Absentees	10
Cautions	11
Section I - Subject Strands	11
Number	14
Geometry	16
Graphing	17
Operations and Properties	18
Measurement	19
Comparison with the 1978 MACOSA Results	21
Section II - Basic Facts	22
Concluding Observations	24

LIBRARY
UNIVERSITY OF ALBERTA

LIST OF TABLES

Page

Table 1: Test Question Distribution for Subject Strands 5

Table 2: Provincial Averages for Subject Strands and Total Test 12

Table 3: Student Completion of Basic-Facts Tests 22

Table 4: Provincial Averages for Basic Facts 23

LIST OF FIGURES

Page

Figure 1: Provincial Averages for Subject Strands and Total Test 13

Figure 2: Provincial Averages for Levels of Thought 14

Figure 3: Comparison of Achievement Results: 1978 and 1982 21

Figure 4: Percentage of Students Demonstrating Mastery of Basic Facts . . 23

ACKNOWLEDGMENTS

The successful administration of the *Grade 3 Mathematics Achievement Test* was the result of the concerted efforts of all involved. Success would have been impossible without substantial contributions from many people, particularly the students, teachers, and administrators who extended their full co-operation.

The technical expertise of Dr. T. O. Maguire, Professor, Division of Educational Research Services, University of Alberta, has been particularly valuable in this first application of the Achievement Testing Program. His contributions to the design, analysis, and reporting are gratefully acknowledged.

Lloyd E. Symyrozum
Director
Student Evaluation Branch

INTRODUCTION

This report presents the provincial results of the *Grade 3 Mathematics Achievement Test* administered on June 8, 1982 as part of the Achievement Testing Program conducted by Alberta Education. The results are reported for 26 452 students in public and separate schools.

The report has an executive summary and three chapters. The executive summary contains a brief description of the Grade 3 mathematics program and test and summarizes the results. Chapter I describes the Achievement Testing Program. Chapter II outlines the procedures followed in test development, describes the *Grade 3 Mathematics Achievement Test*, and defines the sample. The results are presented in Chapter III with guidelines for interpretation.

EXECUTIVE SUMMARY

Findings

- The provincial average is 72.5% for the test, excluding the section on basic facts.

- The provincial averages for the tests on basic facts are as follows:

Addition - 91.3%
Subtraction - 86.3%
Multiplication - 92.1%
Division - 76.9%

- Student scores are considerably above the test average on the topics of counting by tens and twenty-fives, reading and writing numerals, and measurement.

- Students had some difficulty answering questions on three-dimensional geometry.

- Students found it easier to interpret graphs than to label them.

What We Have Learned

- The test has potential for continued use as a reliable measure of student achievement.

- Multiple-choice questions can be used effectively to test Grade 3 mathematics.

- The results appear to indicate that the students took the test seriously even though it did not affect their grades.

The Mathematics Program

The Grade 3 mathematics curriculum outlined in the provincial *Program of Studies* contains five strands of related concepts and skills: number, geometry, graphing, operations and properties, and measurement. Students also learn basic facts in addition, subtraction, multiplication, and division.

Organization of the Test

The test is designed so that the number of questions on each subject strand reflects the proportion of class time spent on that strand. It also tests knowledge of basic facts. The test is organized into two sections.

Section 1 tests the five subject strands of the curriculum (50 questions):

Number - 17 questions
Geometry - 4 questions
Graphing - 4 questions
Operations and Properties - 18 questions
Measurement - 7 questions

Section 2 includes four two-minute tests to measure students' ability to recall basic facts in:

Addition - 20 questions
Subtraction - 20 questions
Multiplication - 15 questions
Division - 15 questions

Results for Subject Strands

The provincial average for this section of the test is 72.5%. The provincial averages for the subject strands are as follows:

Number - 70.8%
Geometry - 59.7%
Graphing - 60.1%
Operations and Properties - 75.4%
Measurement - 83.5%

Scores are considerably above the test average for the following:

Number
- counting by tens
- recognizing a three-digit numeral from its written words
- identifying the fraction of a set of marbles that is shaded

Geometry
- recognizing a triangle

Operations and Properties
- adding two three-digit numbers
- subtracting a two-digit number from a three-digit number
- solving 3 + ☐ = 10
- solving 8 - ☐ = 2

Measurement
- recognizing the correct order of the months
- selecting the appropriate instrument for measuring the length of a desk

Scores are considerably below the test average for the following:

Number
- recognizing the word that represents a four-digit numeral
- recognizing that the middle digit of a three-digit numeral represents that digit multiplied by 10
- identifying the fraction of a rectangle that is shaded
- writing three-digit numerals in expanded notation
- determining which of four geometric figures was one-quarter shaded

Geometry
- recognizing a cylinder
- determining the number of straws required to construct a cube
- determining the number of cubes required to construct a tower

Graphing
- identifying an appropriate label for an axis

Operations and Properties
- subtracting three-digit numbers with borrowing
- estimating the answer to a word problem

Comparison with the 1978 MACOSA Results

In 1978, a similar achievement test was administered to Grade 3 mathematics students. Eighteen questions from the 1978 test were included in the 1982 test to make it possible to compare results. The averages for the subject strands in 1978 and in 1982 using only these 18 questions are given below.

	Averages in Per Cent	
	1978	1982
Number	74.1	79.2
Geometry	55.2	60.8
Operations and Properties	79.8	84.8
Measurement	80.0	83.1

There were no common questions on graphing.

Results for Basic Facts

The provincial averages are 91.3% on addition, 86.3% on subtraction, 92.1% on multiplication, and 76.9% on division. It is of interest to note not only the average score but also the percentage of students attaining mastery on each basic-facts test. An 80% mastery level, for example, corresponds to answering at least 80% of the questions correctly. The percentages of students who attained the 80% and 100% mastery levels are given below.

	Percentage of Students Attaining Mastery	
	80% Level	100% Level
Addition	85.1	56.0
Subtraction	75.3	41.1
Multiplication	89.2	64.8
Division	66.0	30.6

Chapter I

THE ACHIEVEMENT TESTING PROGRAM

Purpose

The Achievement Testing Program is designed to provide data significant at both the local and provincial levels concerning student achievement in language arts, social studies, mathematics, and science for Grades 3, 6, 9, and 11. The purpose of the testing is to monitor the effectiveness of instructional programs by determining the extent to which curricular objectives are being achieved. Since averages are reported for a number of specific topics and skills within each subject area, strengths and weaknesses across the province and within each jurisdiction can be identified. The results provide provincial standards and benchmarks that will serve as a basis for the long-term appraisal of student achievement. These standards will help jurisdictions to evaluate the effectiveness of their local programs.

1982 Tests

Each test is specific to the provincial *Program of Studies* prescribed by the Minister of Education for the subject and grade being tested. Only one subject at any grade level is tested in a given year. The full program of testing is accomplished within a four-year cycle. In 1982, tests were given in Grade 3 mathematics, Grade 6 science, English 30, and English 33. A test for

Grade 9 social studies was scheduled, but it was postponed because the new curriculum had not been fully implemented across the province. Commencing in the 1983-84 school year, achievement testing at the Grade 12 level will be replaced by testing in Grade 11.

The results are reported in the fall term following the testing in June. A summary report is prepared for public distribution, and a more comprehensive report is issued to jurisdictions. Each jurisdiction receives summary tables for that jurisdiction and for each school as well as student scores. Individual statements of results are not issued to students by Alberta Education.

Exemptions from Testing

Under normal circumstances, the following classes are exempt from achievement testing:

- Special Education Classes registered for grants with the Special Educational Services Branch
- classes in which the language of instruction is other than English, under the terms of Section 159 of the *School Act*
- classes in which the subject being tested has been cycled and taught in an alternate year
- classes in which the subject has been taught in a semester other than that in which the test is being administered
- classes for students for whom English is a second language

Chapter II

DESCRIPTION OF TEST AND SAMPLE

This chapter has three main sections. The first outlines the procedures that were followed during test development, the second provides a description of the test, and the third describes the student sample that was tested.

Test Development

There were three stages in the development of the *Grade 3 Mathematics Achievement Test*: preparation of curriculum specifications, development of questions, and selection of questions for the final copy.

1. Curriculum Specifications

   The Curriculum Branch prepared curriculum specifications based on the provincial *Program of Studies*. In the specifications, weightings were assigned to each major subject strand and to specific topics outlined in the *Program of Studies*. These weightings identified the emphasis that each topic was to receive in the program. The curriculum specifications were distributed to all school jurisdictions in the province and minor revisions were made on the basis of the feedback that was received. Topic statements from the curriculum specifications upon which specific questions were based are listed under each subject strand with the results in Chapter III.

2. Development of Questions

A committee composed of teachers and Student Evaluation Branch personnel constructed questions to reflect the topic statements listed in the curriculum specifications. After careful review, questions were also selected from existing tests and item banks. Another teacher committee examined the questions for content validity, and revisions were made based on teacher recommendations and field-test results.

3. Final Copy

A test was constructed from those questions that were approved by the teacher committees. Questions were selected from the various content areas so that each received the emphasis that was recommended in the curriculum specifications. This version of the test was examined by a Technical Review Committee for content validity, accuracy, and technical merit. Additional changes were made to meet their recommendations, and the final copy was printed.

Test Description

The test has two major sections: the first covers the five subject strands that form the core of the Grade 3 mathematics curriculum; the second measures student mastery of basic facts in addition, subtraction, multiplication, and division. All questions are multiple-choice with four alternatives. Students answer questions in the test booklet by filling in circles beside their choices, so separate answer sheets are not required.

Section I - Subject Strands

Section I consists of 50 questions written in two 25-minute sittings. It covers the following five subject strands: number, geometry, graphing, operations and properties, and measurement. The specific content tested within each strand is identified in Chapter III with the results for Section I. The questions measure students' knowledge and comprehension of facts, concepts, and skills, and students' ability to apply knowledge and skills. Knowledge questions require students to recognize facts or to do routine manipulations. Comprehension questions test knowledge of concepts or the ability to translate from concrete to pictorial to symbolic representation. Application questions require students to solve problems, recognize patterns and relationships, or compare, analyze, and apply data. The distribution of questions is presented in Table 1.

Table 1

Test Question Distribution for Subject Strands

		Number of Questions			
Subject Strand	Emphasis	Knowledge	Comprehension	Application	Total
Number	34%	6	10	1	17
Geometry	8%	1	1	2	4
Graphing	8%	2	1	1	4
Operations and Properties	36%	4	9	5	18
Measurement	14%	3	1	3	7
TOTAL		16	22	12	50

Section II - Basic Facts

Section II is a timed test consisting of 20 questions on addition, 20 questions on subtraction, 15 questions on multiplication, and 15 questions on division. The sums, minuends, products, and dividends in these questions are not greater than 18. All other numbers are less than 10. Students are allowed two minutes for each of the basic-facts components.

Sample

A total of 26 452 students representing 990 public and separate schools and 642 students representing 64 private schools were tested. Students from private schools are not included in the results presented in Chapter III.

Each school jurisdiction was given the option of either testing all Grade 3 students or testing randomly selected classes. To ensure a minimal sampling error for jurisdiction results, however, it was necessary to test almost all the classes in small jurisdictions. Since there was little practical benefit from sampling in small jurisdictions, they all chose to test all of their classes. Only two jurisdictions opted for sampling, which was done by class unit. Complete lists of classes for these jurisdictions were obtained and random samples were selected, consisting of 50% of the Grade 3 classes from one jurisdiction and 41% of the Grade 3 classes from the other jurisdiction.

The standard errors due to sampling are less than 0.01% for all provincial averages and less than 0.1% for the two jurisdictions in which sampling was used.

Chapter III

RESULTS

Results are reported for the 26 452 test booklets that were received from public and separate schools. Students who did not answer any questions in either Section I or Section II were omitted from the analysis. In computing provincial averages and percentages, the results from the two jurisdictions which used sampling were weighted because only about half of the students in these districts were selected for testing.

Guidelines for Interpretation of Results

Many factors influence the performance of students within jurisdictions, which makes setting standards a difficult task. Some of these factors are listed below.

1. The tests were developed to sample the Grade 3 mathematics curriculum, but the amount of instruction given on each topic may vary from one class to another.
2. Any time a test is used to estimate achievement, there are minor variations in the results due to factors such as guessing, clerical errors, and errors due to lapses of attention.
3. The size of jurisdiction may influence the results in any particular year, since the average level of aptitude is more likely to fluctuate in smaller jurisdictions than in larger ones.
4. Longer subtests are more reliable than shorter subtests in their estimation of average achievement.

In view of these factors, it was decided that an average of 70% was a reasonable target for the five subject strands. For the basic facts of addition, subtraction, and multiplication, the level was set at 80%, and for division the target was set at 75%. The lower target for division reflects the belief that mastery of division facts may not be completed by the end of Grade 3.

Since the jurisdiction averages are subject to the influences mentioned earlier, target regions have been set up to aid in test interpretation. For the total test and for the longer subtests, these regions are within two points of the target value. For the shorter subtests, the regions have been set at five points around the target. Jurisdictions with fewer than 100 students writing should use differences of five and ten points to identify areas of strength and weakness. The target regions are given below.

Subtest	Number of Questions	Target Regions (%) <100 Students	>100 Students
Total Test	50	65 - 75	68 - 72
Operations and Properties	18	65 - 75	68 - 72
Number	17	65 - 75	68 - 72
Measurement	7	60 - 80	65 - 75
Geometry	4	60 - 80	65 - 75
Graphing	4	60 - 80	65 - 75
Basic Facts			
Addition	20	75 - 85	78 - 82
Subtraction	20	75 - 85	78 - 82
Multiplication	15	75 - 85	78 - 82
Division	15	70 - 80	73 - 77

To interpret the results for a jurisdiction, the reader should first read the sample questions, examine the test specifications, and decide whether the target levels are appropriate for that jurisdiction. Next, the jurisdiction averages should be compared with the target values and those outside the target regions noted. While there is a tendency for people to focus on the areas that

are below the target level, some pride should be taken in those areas that fall above the target region.

It must be emphasized that the purpose of the Achievement Testing Program is to produce results valid at the jurisdictional and provincial levels, not at the individual class or student level. Because of restrictions of time and space, the test questions are only a small sample of possible questions for any curricular objective. Thus, individual student scores may vary greatly, depending on the specific questions selected. Accordingly, the achievement tests were not designed to evaluate individual students, but rather to evaluate the performance of programs within a jurisdiction or within the province. Conclusions about the performance of any given class should not be made either. Most classes have a small number of students and there is a large variation in the average ability of students in different classes.

For large groups of students, variations due to question selection will average out. If the numbers are sufficient, it is meaningful to compare the achievement of groups of students with the provincial averages. Jurisdictional results are presented in tables that parallel the tables of provincial results to facilitate comparisons.

Since standard errors due to sampling are less than 0.1%, any difference between a jurisdictional average and a provincial average is statistically significant. Whether the difference is educationally meaningful is a question that must be addressed by each jurisdiction. Again, the two- and five-point guidelines are useful for the larger jurisdictions and the five- and ten-point guidelines can be used by jurisdictions with fewer than 100 students. Jurisdictions with fewer than 25 students should exercise caution when comparing results with provincial averages.

When examining the results of the achievement tests, readers should keep in mind that a test score cannot reveal why a performance occurred, only that it did occur. After areas of strength and weakness have been determined, the difficult task of identifying the reasons for these strengths and weaknesses should be undertaken. A variety of factors should be examined.

1. Student motivation. Were students motivated to take the test?

2. Student ability. A group of students with a particularly high or low ability level may have been tested. This is much more likely to occur in small systems than in large ones.

3. Teaching curriculum. Since much care was taken in designing the test to fit the Alberta curriculum, areas of weakness may be the result of discrepancies between provincial and local programs.

There will, of course, be other factors that are of importance in particular jurisdictions. Jurisdictions are encouraged to establish local interpretation panels to examine the results in light of local factors.

Absentees

If more than 10% of the eligible students in a jurisdiction did not write the test, the reported average for that jurisdiction may not accurately represent the jurisdiction averages. Teacher-assigned marks for students who did not write could be compared with teacher-assigned marks for students who did write. If the averages are the same for the two groups, the reported jurisdiction averages are probably representative. If the averages are different, some estimates can be made of what the jurisdiction averages might have been if all students had written the test. Jurisdictions with high absentee rates may wish to contact the Student Evaluation Branch for assistance in estimating their jurisdiction averages.

Cautions

The following cautions should be observed when interpreting the results for the *Grade 3 Mathematics Achievement Test*.

1. The information presented is limited to that which can be obtained from a paper-and-pencil test.

2. The questions on the test cover a representative sample of the objectives in the mathematics curriculum. They do not cover every objective.

3. Some of the subtests have only one or two questions. Caution must be exercised when comparing achievement levels among the subtests. It was not possible to ensure that each topic was tested by questions of comparable difficulty.

4. The test is based on the priorities prescribed by the provincial *Program of Studies*. It was not possible to reflect each local jurisdiction's unique interpretation of the program.

Section I - Subject Strands

Over 97% of the students completed the test, indicating that sufficient time was allowed for this section. The questions in this section have been grouped into subtests according to subject strand and level of thought. Provincial averages in per cent are reported in Table 2 for 23 subtests and the total test. The number of questions in each subtest is also given.

Table 2

Provincial Averages for Subject Strands and Total Test

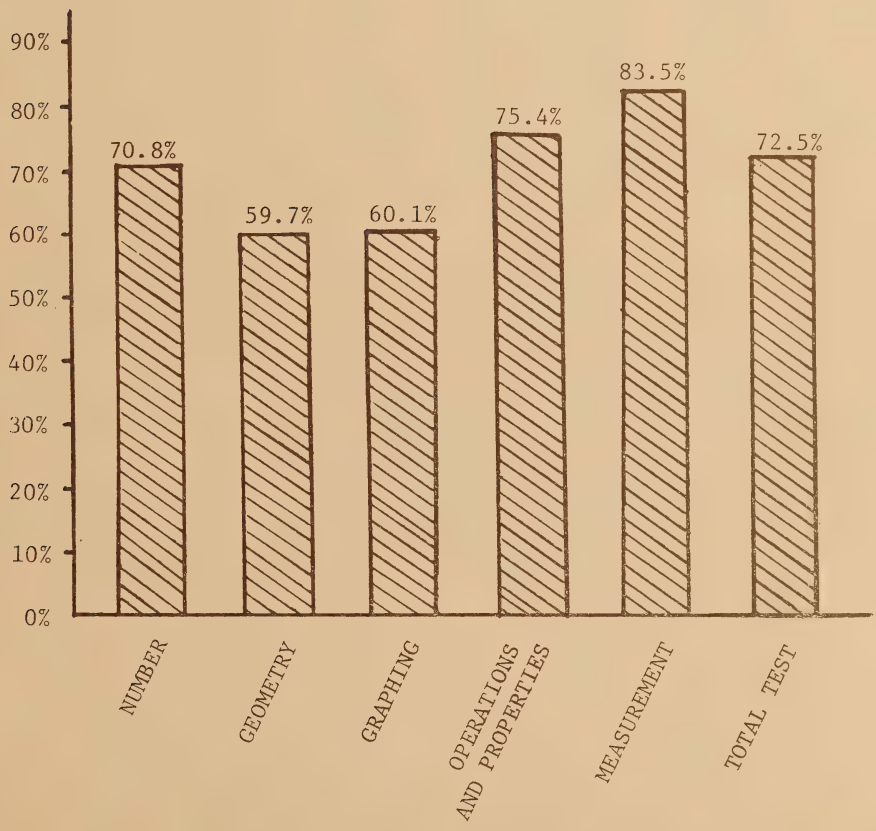
Subtest	Number of Questions	Average Percentage
Number (Knowledge)	6	81.5
Number (Comprehension)	10	67.2
Number (Application)	1	43.5
Number (Total)	17	70.8
Geometry (Knowledge)	1	90.5
Geometry (Comprehension)	1	57.1
Geometry (Application)	2	45.6
Geometry (Total)	4	59.7
Graphing (Knowledge)	2	49.5
Graphing (Comprehension)	1	60.8
Graphing (Application)	1	80.4
Graphing (Total)	4	60.1
Operations and Properties (Knowledge)	4	82.8
Operations and Properties (Comprehension)	9	76.9
Operations and Properties (Application)	5	67.3
Operations and Properties (Total)	18	75.4
Measurement (Knowledge)	3	84.6
Measurement (Comprehension)	1	90.9
Measurement (Application)	3	80.0
Measurement (Total)	7	83.5
Total Knowledge	16	79.1
Total Comprehension	22	71.4
Total Application	12	66.0
Total Test	50	72.5

The standard deviation for the total test is 16.0%. The average for the total test is close to the target of 70%. The averages for operations and properties and measurement are above the upper limits of target regions outlined on page 8. The averages for geometry and graphing are below the lower limits of the target regions.

Provincial averages for the subject strands and the total test are presented graphically in Figure 1. The highest average is for the measurement subtest, and the lowest averages are in graphing and geometry.

Figure 1

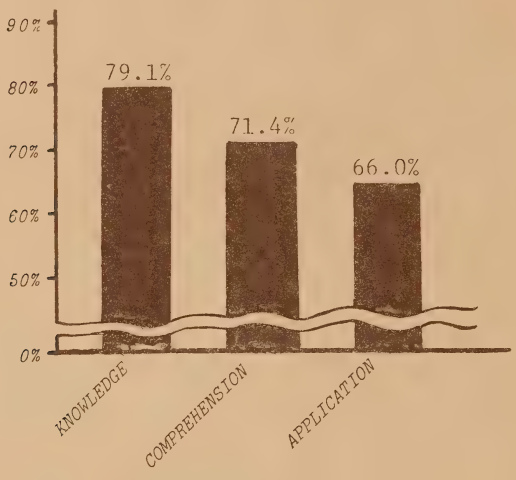
Provincial Averages for Subject Strands and Total Test



Provincial averages for levels of thought are presented graphically in Figure 2.

Figure 2

Provincial Averages for Levels of Thought



The average is highest for the knowledge subtest and lowest for the application subtest. This tendency holds for all of the strands except graphing and measurement. In graphing, the order is reversed and in measurement, the average is higher for the comprehension subtest than for the knowledge subtest.

The results for each subject strand are discussed in detail in the following sections. The topics that were tested within each strand are identified, and sample questions from the test are provided. The circle beside the correct response for each question is darkened, and the percentage of students selecting each alternative is given. Areas of high and low achievement are identified.

Number

Questions related to this subject strand measure ability to:

- order numbers from smallest to largest or vice versa
- count by twos, fives, tens, twenty-fives, and hundreds
- read and write numerals up to 9999

- identify place value up to thousands
- rewrite numbers in expanded notation and vice versa
- identify fractions from physical representations
- read and write decimals to the tenths

Examples 1 and 2 measure ability to read numerals and order numbers, respectively.

Example 1 (Knowledge)

The number 251 is read as:	Distribution of Responses
o twenty five one	8.5%
o twenty five hundred	5.1%
o one hundred fifty two	0.8%
• two hundred fifty one	85.2%
no response	0.4%

Example 2 (Comprehension)

Which set of numbers is in order from SMALLEST to LARGEST?	Distribution of Responses
o 604, 406, 640	18.0%
o 604, 640, 406	6.8%
o 406, 640, 604	6.6%
• 406, 604, 640	66.7%
no response	1.9%

The average for the 17 questions on number is 70.6%. Scores are considerably above the test average for the following:

- 89.1% of the students were able to count by tens.
- 93.7% of the students were able to recognize a three-digit numeral from its written word.
- 88.1% of the students were able to identify the fraction of a set of marbles that was shaded.

Scores are considerably below the test average for the following:

- 57.2% of the students were able to recognize the word representing a four-digit numeral with a zero in the hundreds place.

- 52.5% of the students knew that the second digit, 7, in a three-digit numeral represents 70.

- 47.8% of the students were able to write a three-digit number in expanded notation.

- 54.3% of the students were able to identify the fraction of a rectangle with 10 squares that was shaded.

- 43.6% of the students were able to determine which of four geometric figures was 1/4 shaded.

Geometry

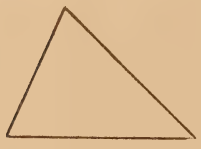
Questions related to this subject strand measure ability to:

- classify and identify two-dimensional figures and three-dimensional objects
- construct two-dimensional objects using straws or wires
- construct three-dimensional objects using Plasticine or modelling clay

Examples 1 and 2 measure ability to identify two-dimensional figures and to construct three-dimensional objects, respectively.

Example 1 (Knowledge)

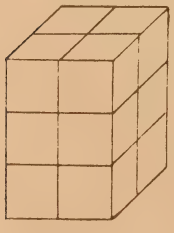
This figure is a



		Distribution of Responses
o	circle	0.2%
o	rectangle	8.3%
o	square	0.5%
●	triangle	90.3%
	no response	0.7%

Example 2 (Application)

How many cubes would it take to make the tower below?



		Distribution of Responses
o	8	6.7%
●	12	44.3%
o	16	25.7%
o	24	22.3%
	no response	1.0%

The average for the four questions on geometry is 59.3%. Scores are considerably above the test average for the following:

- 90.3% of the students were able to recognize a triangle.

Scores are considerably below the test average for the following:

- 56.4% of the students were able to recognize a cylinder.
- 47.9% of the students were able to determine the number of straws required to construct a cube.
- 44.3% of the students were able to determine the number of cubes required to construct a tower shown in a diagram.

Graphing

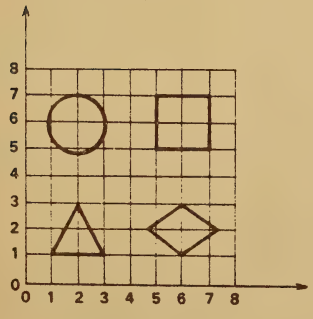
Questions related to this subject strand measure ability to:

- identify axes on a graph
- construct simple bar and line graphs and pictographs
- locate the position of an object on a grid
- plot points on a grid when given two coordinates

Examples 1 and 2 measure ability to plot a point on a grid and to read a pictograph, respectively.

Example 1 (Comprehension)

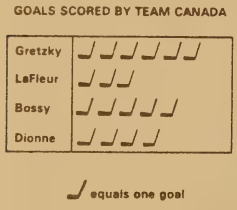
If (2, 6) are coordinates for a point, then the point would be inside



	Distribution of Responses
o △	7.6%
• ○	61.6%
o ◇	18.5%
o □	9.7%
no response	2.6%

Example 2 (Application)

Gretzky scored how many more goals than Dionne?



		Distribution of Responses
•	2	80.2%
o	4	2.2%
o	6	13.9%
o	10	2.4%
	no response	1.3%

The average for the four questions on graphing is 60.0%. Scores are considerably below the test average for the following:

- 33.3% of the students were able to identify the appropriate label for an axis on a graph.

Operations and Properties

Questions related to this subject strand measure ability to:

- identify additive, subtractive, multiplicative, and divisive situations
- add and subtract two- and three-digit numbers
- identify related sentences using an operation
- symbolize multiplication and division situations
- use the commutative property of addition and multiplication
- recall basic facts
- understand the effect of 0 and 1 in addition and multiplication
- multiply whole numbers by 10 and 100
- solve problems and estimate answers

Examples 1 and 2 measure understanding of the commutative property of addition and ability to solve problems, respectively.

Example 1 (Comprehension)

If 24 + 76 = 76 + ☐, then ☐ is

		Distribution of Responses
•	24	58.7%
o	34	4.8%
o	52	9.8%
o	100	24.1%
	no response	2.6%

Example 2 (Application)

Betty's dog eats 2 bones every day. How many days will it take the dog to eat 18 bones?	Distribution of Responses
• 9	61.9%
o 16	11.5%
o 18	6.6%
o 20	17.7%
no response	2.3%

The average for the 17 questions on operations and properties is 75.3%.

Scores are considerably above the test average for the following:

- 89.5% of the students were able to find the sum of two three-digit numbers.
- 88.4% of the students were able to subtract a two-digit number from a three-digit number.
- 88.5% of the students were able to solve 3 + ☐ = 10.
- 90.4% of the students were able to solve 8 - ☐ = 2.

Scores were considerably below the test average for the following:

- 45.4% of the students were able to subtract a three-digit number from another with borrowing.
- 46.5% of the students were able to estimate the answer to a word problem to the nearest hundred.

Measurement

Questions related to this subject strand measure ability to:

- tell and write time to the nearest five minutes
- identify the months of the year in order
- count combinations of coins up to $1.00 and make change
- extend estimation and measurement to include the use of kilometres and decimetres
- use standard instruments such as metre sticks, litre containers, mass scales, and Celsius thermometers

Examples 1 and 2 measure knowledge of the order of the months of the year and ability to estimate length, respectively.

Example 1 (Knowledge)

The correct order of the 3 months that come right after June is	Distribution of Responses
o August, July, September	2.0%
o August, September, July	1.9%
• July, August, September	92.6%
o July, September, August	2.1%
no response	1.4%

Example 2 (Application)

About how long is this crayon?

	Distribution of Responses
o 1 cm	1.6%
o 5 cm	10.3%
• 10 cm	73.2%
o 20 cm	12.8%
no response	2.1%

The average for the seven questions on measurement is 83.3%. Scores are considerably above the test average for the following:

- 92.6% of the students knew the correct order of four months.
- 91.0% of the students knew that a metre stick could be used to measure the length of a desk.

Comparison with the 1978 MACOSA Results

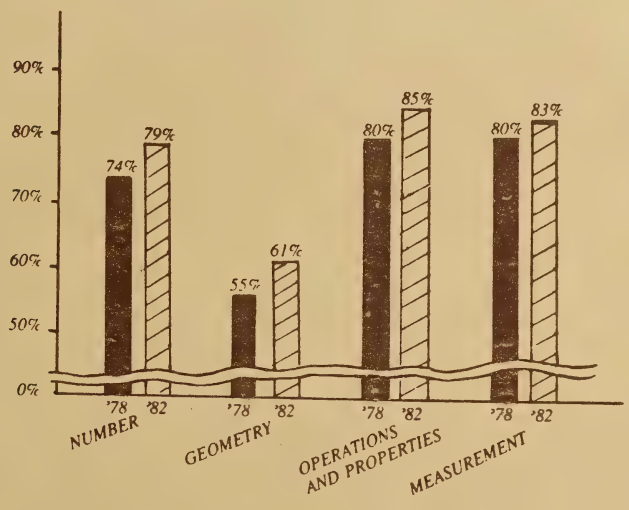
In 1978, a similar achievement test was administered to Grade 3 mathematics students in Alberta. Eighteen questions from the 1978 test were included in the 1982 test to make it possible to compare results. These 18 questions are distributed across the five subject strands as follows:

Number - 7
Geometry - 3
Graphing - 0
Operations and Properties - 5
Measurement - 3

The graph in Figure 3 shows the average percentage for each strand in 1978 and 1982 using only these 18 questions.

Figure 3

Comparison of Achievement Results: 1978 and 1982



Section II - Basic Facts

The time assigned to the basic-facts tests was carefully selected to allow enough time for students to answer all questions if they could recall the basic facts quickly. If students had to think about the answers for a long time or if students obtained answers by counting, they would not have had time to answer all questions. The percentage of students completing each component of the basic-facts test is presented in Table 3. Students found the subtraction component the most difficult to complete and the multiplication component the easiest to complete.

Table 3

Student Completion of Basic-Facts Tests

Test	Number of Questions	Percentage of Students Completing Test
Addition	20	77.9
Subtraction	20	72.7
Multiplication	15	92.2
Division	15	79.1

The provincial averages in per cent for the basic-facts tests are presented in Table 4. The averages for all basic facts are higher than the upper limits of the target regions outlined on page 8.

Table 4

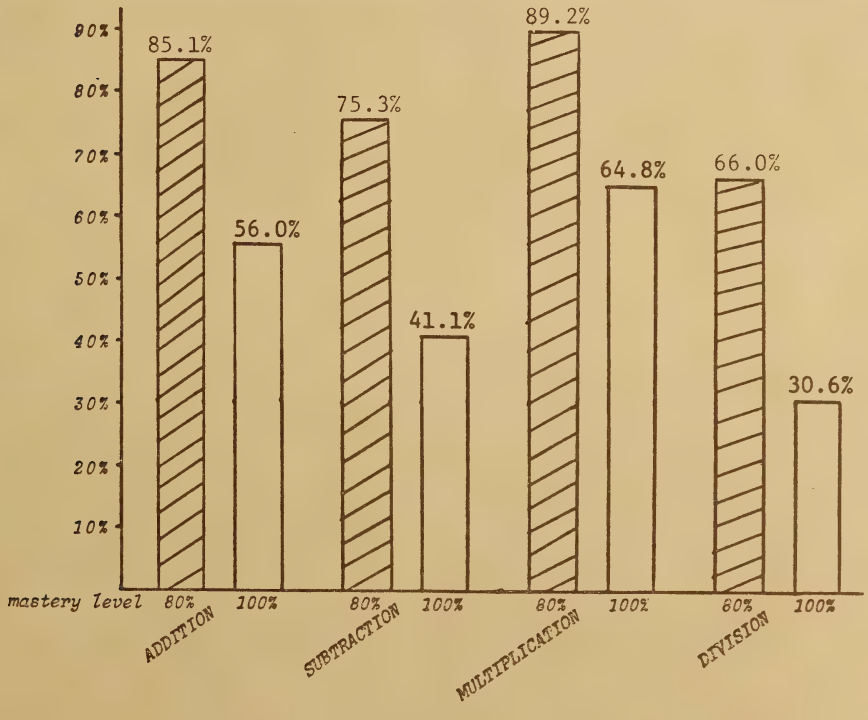
Provincial Averages for Basic Facts

Test	Number of Questions	Average Percentage
Addition	20	91.3
Subtraction	20	86.3
Multiplication	15	92.1
Division	15	76.9

It is also of interest to note the percentage of students attaining mastery on each basic-facts test. An 80% mastery level, for example, corresponds to answering 80% of the questions correctly. The percentage of students who attained the 80% and 100% mastery levels is given in the graph in Figure 4.

Figure 4

Percentage of Students Demonstrating Mastery of Basic Facts



Concluding Observations

The provincial average for the total score on Section I is very close to the target identified under guidelines for interpretation of results. The averages are higher than the upper limits of the target regions for operations and properties and measurement. The average is within the target region for number. The averages are below the lower limits of the target regions for geometry and graphing.

The averages are higher than the upper limits of the target regions for all basic facts. It should be noted that 15%, 25%, 11%, and 34% of the students did not achieve the 80% mastery level in addition, subtraction, multiplication, and division respectively.

DATE DUE SLIP

DUE EDUC APR 10 '87	
APR 08 RETURN	
DUE EDUC. SEP 18 '87	
NOV 24 RETURN	
DUE EDUC. MAY 16 '91	
MAY 14 RETURN	

255

JUN 1 2 1985

LB 3054 C2 D3333 1982
PROVINCIAL REPORT ACHIEVEMENT
TESTING PROGRAM GRADE 3 --

SERIAL MI 39910003 EDUC

000034691170

B49310